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## DETAILED DESCRIPTION

### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is an antenna of broadband-ized structure carried mainly in a personal digital assistant, and relates to the antenna improved so that antenna mounting area might become small in detail.

[0002]

[Description of the Prior Art] Conventionally, as an antenna of this kind of broadband-ized structure, the thing of composition as shown, for example in the appearance perspective view of drawing 6 is mentioned. This antenna is a thing relevant to the wideband antenna and array antenna system which were indicated by JP,2001-284946,A, Allocate the dipole antenna element 2 which has a length of about 70 percent compared with the length of the half-wave length of a free space wave length in the surface of the dielectric plate 1 with thin rectangular form prolonged in the transverse direction, and. A total of four band-like passive elements 3a, 3b, 3c, and 3d which comprise 2 sets of couples which have one fourth of the length of a free space wave length near the both ends of this dipole antenna element 2, and which are mutually parallel and counter are allocated, It has the structure which allocated the input/output terminal 5 which changes from a coaxial plug to the pars basilaris ossis occipitalis of the dielectric plate 1 so that the inner conductor might be connected to the terminated line 4a allocated in the rear face of the dielectric plate 1 and the outer conductor might be connected to the dipole antenna element 2. By adjusting the arrangement interval of the dipole antenna element 2 and each passive elements 3a, 3b, 3c, and 3d, the reflection property in the antenna feeding point is crossed to a broadband, and it can improve now.

[0003] The antenna system etc. which were incidentally indicated by the micro strip antenna indicated by JP,H6-224621,A and JP,H11-136023,A, for example and JP,2000-188506,A as well-known technology of others relevant to such an antenna are mentioned.

[0004]

[Problem to be solved by the invention] The area which allocates two or more passive elements besides the area which allocates a dipole antenna element on a dielectric plate in the case of the antenna of the broadband-ized structure shown in drawing 6 mentioned above is required, When the antenna mounting area which these allocation takes becomes large, the area for mounting

accessories, such as other circuit components and a functional part, decreases. As a result, in order to secure the mounting area of accessories, the mounting area of an antenna decreases, and there is a problem of being hard to aim at improvement in an antenna characteristic.

[0005]It was made that this invention should solve such a problem, and the technical problem is in providing the antenna of the broadband-ized structure which can make antenna mounting area small and may improve an antenna characteristic.

[0006]

[Means for solving problem]The antenna pattern which comprises the conductive thin film which according to this invention was allocated by inverted-L-shaped so that pattern length might become one fourth of free space wave lengths on the surface, The ground pattern which comprises the conductive thin film allocated by extending from near this antenna pattern, And the dielectric substrate which is arranged at two sides which the periphery of this ground pattern adjoins, and has the 1st terminal area as the long side of this ground pattern, or a shorter side where the size of a longitudinal direction is almost the same, The ground pattern for adjustment which comprises a conductive thin film is allocated in the surface, and. It has two or more flexible bases which comprise the thin flexible dielectric in which the 2nd terminal area with which the electric connection with one thing of said 1st terminal area is presented was established in the periphery of this ground pattern for adjustment, The antenna which is the structure where continuity connection of said ground pattern and said ground pattern for adjustment was carried out by said 2nd terminal area of two or more of said flexible bases being connected to one thing of two or more of said 1st terminal areas of said dielectric substrate, respectively is obtained.

[0007]According to this invention, in the above-mentioned antenna a dielectric substrate and two or more flexible bases, Storage disposition is carried out into a case, two or more flexible bases are stir-fried so that the ground pattern for adjustment may meet the internal surface of a case, respectively, and the antenna arranged so that a tip end part might extend to the rear-face side of a dielectric substrate is obtained.

[0008]The antenna pattern which comprises the conductive thin film allocated by inverted-L-shaped on the other hand according to this invention so that pattern length might become one fourth of free space wave lengths on the surface, It was extended and allocated from near this antenna pattern. The dielectric substrate which has two or more conductive pieces of connection in the periphery of the ground pattern which comprises a conductive thin film, and this ground pattern, It comprises a case in which the conductive thin film ground pattern was allocated in the prescribed spot of an internal surface, and the antenna by which storage disposition was carried out so that continuity connection of this ground pattern and this thin film ground pattern might be carried out by the piece of connection of this plurality is obtained.

[0009]As for a thin film ground pattern, in this antenna, it is preferred to form a conductive material to the internal surface of a case by vacuum evaporation, to be formed in it, or to apply a conductive material and to be formed. As for two or more pieces of connection, in these antennas, it is preferred that they are a flat spring which makes it bend and has the flexibility

which can be arranged in a case, and a spring probe which has the elasticity which can be arranged in a case without making it bend.

[0010]On the other hand, according to this invention, in which antenna of the above the size of the ground pattern for adjustment, The antenna by which selection decision was carried out so that the size of what added the size of the ground pattern based on the result of having measured grand size and the characteristic of the antenna zone beforehand may become the optimal as this antenna zone is obtained.

[0011]

[Mode for carrying out the invention]An embodiment of the invention is described in detail with reference to Drawings below.

[0012]Drawing 1 is what showed the basic constitution of the antenna concerning one embodiment of this invention, The figure (a) is related with a side view [ in / in the thing about the top view which decomposed component part, the thing about a side view / in / in the figure (b) / the longitudinal direction of an assembly state /, and the figure (c) / the transverse direction of an assembly state ].

[0013]This antenna is extended and allocated in the surface from the antenna pattern 12 which comprises the conductive thin film allocated by inverted-L-shaped, and near this antenna pattern 12 so that pattern length may be set to one fourth of free space wave lengths, and. The dielectric substrate 11 which has the ground pattern 13 of the rectangular form which comprises the conductive thin film in which the 1st two band-like terminal area 14a and 14b with which the connection electric to two places by the side of the verge which adjoins mutually is presented was formed, The 1st ground pattern 16 for adjustment of the rectangular form which comprises a conductive thin film is allocated in the surface, and. The 1st flexible base 15 of the rectangular form which comprises the thin flexible dielectric in which the 2nd band-like terminal area 17 with which the electric connection with the 1st terminal area 14a is presented was established in one place of the one-side veranda in the longitudinal direction of this ground pattern 16 for adjustment, The 2nd ground pattern 19 for adjustment of the rectangular form which comprises a conductive thin film is allocated in the surface, and. Have the 2nd flexible base 18 of the rectangular form which comprises the thin flexible dielectric in which the 2nd band-like terminal area 20 with which the electric connection with the 1st terminal area 14b is presented was established in one place of the one-side veranda in the longitudinal direction of this ground pattern 19 for adjustment, and further, These each part. In the case 10 of the core box of rectangular form, each flexible base 15, It is constituted as a structure by which storage disposition was carried out so that continuity connection of the ground pattern 13 and the ground patterns 16 and 19 for adjustment might be carried out by the 2nd terminal area 17 and 20 of 18 being connected to each 1st terminal area 14a of the dielectric substrate 11, and 14b, respectively.

[0014]Drawing 2 is what showed 1 example computation for explaining the antenna characteristic at the time of changing the size of the ground pattern 13 allocated on the dielectric substrate 11 with which this antenna is equipped, The figure. Thing about the reflection property

in the antenna feeding point when the thing concerning [ (a) ] a computational model and the figure (b) make the long side size L in the longitudinal direction of the ground pattern 13 the 1st value ( $L= 90$  mm), and the figure (c) the long side size L in the longitudinal direction of the ground pattern 13. Thing about the reflection property in the antenna feeding point at the time of using the 2nd value ( $L= 120$  mm) and the figure (d) show change of the zone over change of the long side size L in the longitudinal direction of the ground pattern 13 containing the size of the figure (b) and the figure (c).

[0015]Although drawing 2 (b) and (c) here shows that the zone of an antenna is changed to change of the size of the ground pattern 13, Since this thinks as important the supplementary conditions on use of being easy to put the size of the personal digital assistant which usually carries an antenna into the ease of having, a pocket, etc. and is designed, The size of the dielectric substrate 11 incorporated in a personal digital assistant or the size of the ground pattern 13 received design restriction, and it has suggested that the size of the ground pattern 13 does not necessarily serve as the optimal value (size) for zone specification of an antenna under such a situation.

[0016]Then, grand size and the characteristic of an antenna zone are beforehand measured and grasped in such a case, If the ground pattern 16 for adjustment of the flexible base 15 is made the ground pattern 13 on the dielectric substrate 11 from the band characteristic of an antenna by size of the ground pattern 13 with composition which makes addition connection, optimal grand size can be adjusted. For example, since a zone as an antenna serves as the minimum when the long side size L in a longitudinal direction of the ground pattern 13 is  $L= 90$  mm, as shown in drawing 2 (b), A band characteristic can be expanded and optimized, if it adjusts so that  $L= 120$  mm may be approached when carrying out the addition design of the ground pattern 16 for adjustment. When a value of the long side size L in a longitudinal direction of the ground pattern 13 is incidentally changed in this way, the reflection property of the antenna feeding point containing  $L= 90$  mm in drawing 2 (b) and (c) and 120 mm comes to be shown in drawing 2 (d). Since a zone as well as a case where a value of a long side is changed will change if a value of the shorter side size W in a short side direction of the ground pattern 13 is changed although not illustrated here, A zone can be expanded and optimized by adjusting the ground pattern 19 for adjustment of the flexible base 18 to size that an antenna zone serves as the maximum, and making addition connection from a characteristic figure. That is, selection decision of the size of the ground patterns 16 and 19 for adjustment is carried out so that a size of what added a size of the ground pattern 13 based on a result of having measured grand size and the characteristic of an antenna zone beforehand may become the optimal as an antenna zone.

[0017]Anyway, the ground patterns 16 and 19 for adjustment by which addition connection is made are sagged so that the nearby internal surface (medial surface) of the cases 10, such as a personal digital assistant, may be met with the flexible character which the flexible bases 15 and 18 have, and they can be incorporated.

[0018]Incidentally as an example of the 1st terminal area 14a and 14b in the ground pattern 13 of the dielectric substrate 11, and the 2nd terminal area 17 and 20 in the ground patterns 16 and 19

for adjustment of each flexible bases 15 and 18, Although the case where it is considered as the connection structure which solders directly, and the case where it is considered as the connector structure which makes fitting connection after dividing and arranging the connector of a male and a female die can be illustrated, To the 1st terminal area 14a and 14b, an intermediary the size of a longitudinal direction so that almost similarly to the long side of the ground pattern 13, or a shorter side. The thing to do and [for which only the size of the longitudinal direction of the 1st terminal area 14b has the same size as the shorter side of the ground pattern 13 with the form shown in drawing 1(a) - (c)] is preferred. Although the number of the number of the 1st terminal areas 14a and 14b in the ground pattern 13 of the dielectric substrate 11 used here, each flexible bases 15 and 18, and the 2nd terminal areas 17 and 20 explained the case of which 2, these numbers are examples to the last, and can be changed arbitrarily.

[0019]In the case of an antenna concerning one embodiment mentioned above, an occupation area of the antenna pattern 12 on the dielectric substrate 11 is small, And the 1st terminal area 14a and 14b in the ground pattern 13, And since antenna mounting area is small when the 2nd terminal area 17 and 20 in the ground patterns 16 and 19 for adjustment of each flexible bases 15 and 18 connected with these can be managed with few occupation areas, An area for mounting accessories, such as other circuit components and a functional part, can be enlarged. It has composition of being easy to aim at improvement in an antenna characteristic in little antenna mounting area.

[0020]Drawing 3 is what showed basic constitution at the time of changing arrangement of each flexible bases 15 and 18 with which this antenna is equipped, The figure (a) is related with a side view [ in / in a thing about a top view which decomposed component part, a thing about a side view / in / in the figure (b) / a longitudinal direction of an assembly state /, and the figure (c) / the transverse direction of an assembly state ].

[0021]A point which collapsed each flexible bases 15 and 18 in the rear-face side of the dielectric substrate 11, and arranged them within the case 10 while this antenna had made composition of each part the same compared with a case of composition of one previous embodiment is different. That is, each flexible bases 15 and 18 by which storage disposition was carried out into the case 10 here are stir-fried so that the ground patterns 16 and 19 for adjustment may meet an internal surface of the case 10, respectively, and they are arranged so that a tip end part may extend to the rear-face side of the dielectric substrate 11.

[0022]Also in an antenna of such an arrangement configuration, like a case of one previous embodiment, antenna mounting area is small and it has composition of being easy to aim at improvement in an antenna characteristic.

[0023]Drawing 4 is what showed basic constitution of an antenna concerning other embodiments of this invention, The figure (a) is related with a side view [ in / in a thing about a top view which decomposed component part, a thing about a side view / in / in the figure (b) / a longitudinal direction of an assembly state /, and the figure (c) / the transverse direction of an assembly state ].

[0024]Unlike a thing of one previous embodiment, a total of ten conductive flat springs 21 which

have flexibility are used for this antenna instead of using each flexible bases 15 and 18, and. After allocating the two conductive thin film ground patterns 22 in two internal surfaces which the case 10 adjoins, It has composition of having connected one end of each flat spring 21 to a regular intervals verge close-attendants side [ in the ground pattern 13 of the dielectric substrate 11 / adjoining / each ] part, respectively, and having connected the other end to a regular intervals part of each thin film ground pattern 22 of an internal surface in which the case 10 adjoins, respectively.

[0025]In the case of this antenna, speaking concretely, being extended and allocated in the surface from near the antenna pattern 12 which comprises a conductive thin film allocated by inverted-L-shaped, and the antenna pattern 12 so that pattern length may be set to one fourth of free space wave lengths, and. The dielectric substrate 11 of rectangular form which has the ground pattern 13 of rectangular form which comprises a conductive thin film in which electric connection is presented with two or more regular intervals two verge close-attendants side [ adjoining ] parts, An end is provided with a total of ten flat springs 21 which have the flexibility which is a conductive piece of connection connected with a regular intervals two verge close-attendants side [ in the ground pattern 13 / adjoining ] part, respectively, These each part. To two adjoining internal surfaces. The two conductive thin film ground patterns 22. So that the other end of each flat spring 21 may be connected to a regular intervals thing [ of each thin film ground pattern 22 / nearby ] part into the case 10 estranged and allocated, respectively (or contact) and each flat spring 21 may meet a nearby internal surface of the case 10, respectively. Storage disposition is carried out so that continuity connection of the ground pattern 13 and each thin film ground pattern 22 may be carried out after being stir-fried and arranged, And after adjusting size of the thin film ground pattern 22, respectively so that an antenna zone may serve as the maximum beforehand, it is constituted as a broadband-ized structure.

[0026]The two thin film ground patterns 22 allocated in two internal surfaces which the case 10 in this antenna adjoins can illustrate the case where form a conductive material to the internal surface of the case 10 by vacuum evaporation, and are formed in it, or apply a conductive material and it is formed. The number of the flat springs 21 used for the form of the connection configuration of the ground pattern 13 and each thin film ground pattern 22 and its connection is an example to the last, and these numbers can be changed arbitrarily.

[0027]Also in this antenna, the occupation area of the antenna pattern 12 on the dielectric substrate 11 is small, And it is the composition of connecting between the regular intervals parts of the two thin film ground patterns 22 provided in two internal surfaces by which the case 10 adjoins a regular intervals verge close-attendants side [ in the ground pattern 13 / adjoining / each ] part with each flat spring 21, Since antenna mounting area is small, it has the composition of the area for mounting accessories, such as other circuit components and a functional part, being enlarged, and being easy to aim at improvement in an antenna characteristic.

[0028]Drawing 5 is what showed the basic constitution of the antenna concerning another embodiment of this invention, The figure (a) is related with a side view [ in / in the thing about the top view which decomposed component part, the thing about a side view / in / in the figure

(b) / the longitudinal direction of an assembly state /, and the figure (c) / the transverse direction of an assembly state ].

[0029]Use a total of the 11 conductive spring probes 23 which have elasticity instead of this antenna using each flexible bases 15 and 18 unlike the thing of one previous embodiment, and. After allocating the two conductive thin film ground patterns 22 in two internal surfaces which the case 10 adjoins, The end of each spring probe 23 is connected to the part estranged by the regular intervals by the side of each adjoining verge close attendants in the ground pattern 13 of the dielectric substrate 11, respectively, And it has the composition of having connected the other end to the part estranged by the regular intervals of each thin film ground pattern 22 of an internal surface in which the case 10 adjoins, respectively.

[0030]In the case of this antenna, speaking concretely, being extended and allocated in the surface from near the antenna pattern 12 which comprises the conductive thin film allocated by inverted-L-shaped, and the antenna pattern 12 so that pattern length may be set to one fourth of free space wave lengths, and. The dielectric substrate 11 of the rectangular form which has the ground pattern 13 of the rectangular form which comprises the conductive thin film in which electric connection is presented with two or more regular intervals two verge close-attendants side [ adjoining ] parts, An end is provided with a total of the 11 spring probes 23 which have the elasticity which is a conductive piece of connection connected with a regular intervals two verge close-attendants side [ in the ground pattern 13 / adjoining ] part, respectively, These each part. To two adjoining internal surfaces. The two conductive thin film ground patterns 22. In the case 10 estranged and allocated. The other end of each spring probe 23. On a regular intervals thing [ of each thin film ground pattern 22 / nearby ] part. Storage disposition is carried out so that continuity connection of the ground pattern 13 and each thin film ground pattern 22 may be carried out after being arranged without being connected, respectively (or contact) and stir-frying each spring probe 23 at right angles to the nearby internal surface of the case 10, respectively, And after adjusting the size of the thin film ground pattern 22, respectively so that an antenna zone may serve as the maximum beforehand, it is constituted as a broadband-ized structure.

[0031]A case where form a conductive material to an internal surface of the case 10 by vacuum evaporation also in the two thin film ground patterns 22 allocated in two internal surfaces which the case 10 in this antenna adjoins, and it is formed in it, or apply a conductive material and it is formed can be illustrated. The number of the spring probes 23 used for a form of a connection configuration of the ground pattern 13 and each thin film ground pattern 22 and its connection is an example to the last, and these numbers can be changed arbitrarily.

[0032]Also in this antenna, an occupation area of the antenna pattern 12 on the dielectric substrate 11 is small, And it is the composition of connecting between regular intervals parts of the two thin film ground patterns 22 provided in two internal surfaces by which the case 10 adjoins a regular intervals verge close-attendants side [ in the ground pattern 13 / adjoining / each ] part with each spring probe 23, Since antenna mounting area is small, it has composition of an area for mounting accessories, such as other circuit components and a functional part, being enlarged, and being easy to aim at improvement in an antenna characteristic.

[0033]

[Effect of the Invention] Within a case, to a dielectric substrate, shall electrically connect two or more flexible bases, and, according to the antenna of this invention, accommodation disposition shall be carried out as stated above. The 1st terminal area established in the periphery of the ground pattern of a dielectric substrate in this state is connected to the 2nd terminal area established in the part of the ground pattern for adjustment of a flexible base, and. The antenna pattern on a dielectric substrate is allocated in a part by inverted-L-shaped so that the pattern length may be set to one fourth of free space wave lengths, And use two or more conductive pieces of connection instead of having composition which adjusted the size of the ground pattern for adjustment, or using a flexible base so that an antenna zone may serve as the maximum by an assembly state beforehand, and. Allocated the conductive thin film ground pattern in the internal surface of a case, and also the end of each piece of connection is connected to a regular intervals verge close-attendants side [ in the ground pattern of a dielectric substrate / each ] part, respectively, Since the other end has composition connected to a regular intervals thin film ground pattern [ of the internal surface of a case ] part, respectively, the ground pattern for adjustment or a thin film ground pattern can be added to a ground pattern, and the whole grand size can be changed into it, Since the zone of an antenna changes with grand size as drawing 2 explained, By grasping grand size and the characteristic of the antenna zone beforehand, If a ground pattern is added in suitable size, optimization of an antenna zone can be attained, And since size of the thin film ground pattern is considered as the composition adjusted, respectively so that an antenna zone may serve as the maximum by an assembly state beforehand, Also when which composition is applied, antenna mounting area comes to be assembled as the greatest small broadband-sized structure, moreover can apply the case of a size as usual, and its antenna zone may come to improve an antenna characteristic more than before.

**PROBLEM TO BE SOLVED:** To provide an antenna having a broad band structure and capable of reducing an antenna mounting area, and improving antenna characteristics. ;

**SOLUTION:** In this antenna, two flexible boards 15 and 18 are electrically connected to a dielectric board 11 and housed and arranged in a case body 10, and first connecting parts 14a and 14b locally formed on a ground pattern 13 of the dielectric substrate 11 are respectively connected to second connecting parts 17 and 20 locally formed on ground patterns 16 and 19 for adjusting respective flexible boards 15 and 18. An antenna pattern 12 on the dielectric substrate 11 is configured so as to be locally disposed like an inverse L so that the pattern length is set to be 1/4 of free space wavelength. The sizes of ground patterns 16 and 19 for adjustment are preliminarily adjusted so that the antenna band can be maximized in an assembly condition. Hence it is possible to assemble the antenna having a broad band structure in which the antenna band is maximized. ;

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